ForOpenCL and LOPe:
Tools and a Programming Model for Accelerating Stencil-Based Applications

LOPe (Locally-Oriented Programming extensions)
- *simplifies exploiting multiple levels of parallelism*
- *both on chip and across nodes*
- *for C and Fortran*

New parallel attributes for functions and types
- *concurrent functions applied to data parallel elements*
- *halo attribute extends view of a thread's array element*
- *exchange_halo() syncs array halos across all memory*

Original image

With Blurring Stencil

```
real :: F(-3:3,…)
real :: I(m,n)[*,*]
HALO :: I(-3:*:3,…)
!… initialize image
!… using coarray I
call exchange_halo(I)
call convolve(I,F)
```

```
CONCURRENT subroutine &
convolve(I,F)
  real, HALO(:,:) :: I(:,:)
  real :: F(:,:)
  I(1,1) = sum(I*F)
end subroutine
```

A simple stencil example that allows the compiler to fully exploit multiple levels of parallelism.

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